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EFFECT OF CROP RESIDUE ON DOWNY BROME EMERGENCE

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INTRODUCTION

The 1985 Food Security Act mandates that tillage and residue management systems should be implemented on highly erodible land (HEL) to slow soil erosion to acceptable levels. Many growers have elected to leave a minimum of 30 percent residue on the surface of their fields to meet these requirements. Growers in the Pilot Rock area noticed a marked increase in the incidence of downy brome (*Bromus tectorum* L.) in their winter wheat fields when they left sufficient residue on the soil surface to comply with conservation requirements. Similar increases in downy brome have been observed in other fields under tillage systems designed to retain more crop residues on the soil surface (Veseth et al., 1994).

An experiment was conducted in 1993 to study effects of surface residue, weather, and soil conditions on downy brome emergence. The plots were set on newly-seeded winter wheat fields in the Pilot Rock area. Treatments included four levels of crop residue: none (background level, about 10 percent) and additions of residue to give 20, 30, and 40 percent cover.

In these experiments, the numbers of downy brome plants that emerged were the same in all four residue treatments. However, the residue had a tendency to move from where it had been placed. It tended to fall from the top of the ridges where the data collection points were located, into the depression of the row formed by deep furrow drills. This movement of residue made the measured lack of correlation between residue cover and downy brome emergence questionable.

To investigate the possible correlation, another experiment was designed to answer the question of whether the presence of residues encourages downy brome establishment. The experiment was put on flat soil where the residue would have little chance of shifting.

MATERIALS AND METHODS

The site consisted of four replicate plots at the Pendleton Research Center on a Walla Walla silt loam (coarse-silty, mixed, mesic Typic Haploxerolls) soil. On October 20, 1994, downy brome was seeded across the site using a Gandy spreader at a rate of 50 seeds per square foot and lightly hand raked into the top half-inch of soil. Fumigated winter wheat residue was then spread over the four major plots, so that each replication had a range of residue across it with zero percent cover at one end extending to one hundred percent cover at the other end. Plastic large mesh netting held the residue in place.

Data were collected on December 20, 1994, when emergence was nearly complete. Percentage residue cover was measured five times within each replication using the line transect method (Laflen et al., 1981). Counts of emerged downy brome plants were made in the same five places within each replication where the residue cover data had been taken. A rectangular quadrat 53 square inches in area was used to count the emerged plants. If necessary, the netting was removed and residue pushed away from the count site to facilitate plant counts.

RESULTS AND DISCUSSION

The number of emerged downy brome plants per square foot was plotted against percent residue cover (Figure 1). There was no linear relationship between the amount of residue cover and the number of emerged downy brome plants; there were about 45 plants per square foot regardless of the level of residue.

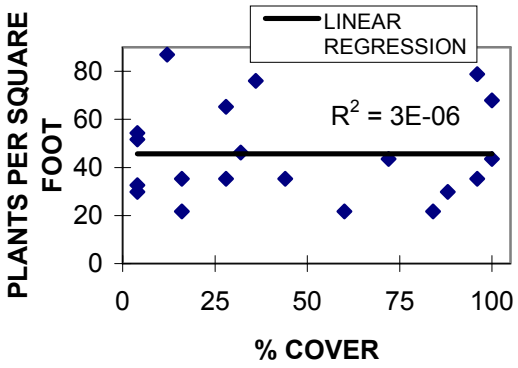

Figure 1. Influence of crop residue cover on downy brome seedling establishment, Pendleton, OR

Generally, emergence of downy brome is vigorous at temperatures between 32 deg F and 70 deg F if soil moisture is adequate (Veseth et al, 1994). In this experiment, soil moisture and temperature were both favorable and adequate growing degree days had been accumulated for emergence of downy brome (Table 1). A previous study (Hulbert, 1955) indicated that downy brome seeds sheltered from light emerge at faster rates than those exposed to light. Instead of seeing a marked increase in emerged plants in the areas with heavy residue cover where nearly all light is blocked and where moisture should also be favorable, the heavily covered areas exhibited no signs of increased plant emergence. This study showed no statistically significant differences in emergence of downy brome among the various residue treatments.

Table 1. Temperature, precipitation and cumulative degree days for experimental site at Pendleton, OR

DATE	PRECIP (IN)	AV. TEMP (F)	AV. TEMP (C)	TOTAL DEGREE DAYS
OCT 20-OCT 26	0.15	46.6	8.1	56
OCT 27-NOV 2	2.22	46.4	8.0	112
NOV 3- NOV 9	1.07	37.9	3.3	135
NOV 10-NOV 16	0.48	42.1	5.6	175
NOV 17-NOV 23	0.11	34.9	1.6	186
NOV 24-NOV 30	0.72	39.5	4.2	216
DEC 1-DEC 7	0.30	29.8	-1.2	233
DEC 8-DEC 14	0.24	30.9	-0.6	238
DEC 15-DEC 20	0.59	37.9	3.3	280

From these data we have concluded that the observations in the original experiment were valid: the mere presence of high levels of residue does not enhance downy brome emergence. It is probable that the increases in downy brome infestation observed by growers are related to the fact that fields with higher levels of residues also had higher levels of downy brome seed near the surface where they could emerge readily. These higher levels of seed occur because chiseling leaves statistically significantly more seed near the surface than does moldboard plowing (Staricka, 1990).

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